

Quantum sensing: Multiple parameters & fault tolerance

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Abstract

Quantum sensing of a single parameter is not fully quantum. It is only with the simultaneous estimation of multiple parameters at the quantum limit that we enter the realm of fully-quantum sensing. This is due to the non-commutativity involving in measuring multiple quantities simultaneously. Estimating multiple parameters simultaneously is also central to most advanced application of quantum sensing including imaging, spectroscopy, 3D magnetometry, accelerometry and gravimetry. I will discuss recent progress in multiparameter quantum sensing, focussing on imaging and 3D magnetometry.

Combating noise through improved sensor engineering is crucial to the long-term prospects of quantum sensing. I will introduce the notion of fault-tolerant quantum sensing and present our results on how better devices can enable combating larger noise in the signals being sensed.